Notice of Allowability	Application No.	Applicant(s)	
	10/622,376	WAITE ET AL.	
	Examiner	Art Unit	
	Carol S. Tsai	2857	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *11/7/2005*.

2. ☒ The allowed claim(s) is/are *1-49*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date 11/07/05
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

DETAILED ACTION

Allowable Subject Matter

1. Claims 1-49 are allowed.

2. The following is an examiner's statement of reasons for allowance:

U. S. Publication 2004/0070399 to Olsson et al. in view of U. S. Patent No. 6,310,579 to Meredith are references closest to the claimed invention. Olsson et al. in combination with Meredith disclose Olsson et al. disclose a locator receiver, comprising: at least one processing channel including an electromagnetic field detector; an analog processor coupled to receive signals from the electromagnetic field detector, and a digital processor coupled to receive signals from the analog processor and calculate a signal strength parameter and a modulated signal, wherein the digital processor includes an analog-to-digital converter, a digital phase-locked loop coupled to receive the output signal from the analog-to-digital converter and provide the signal strength parameter, and a nested digital phase-locked loop coupled to the phase-locked loop to provide the modulated signal. However, Olsson et al. in combination with Meredith do not teach the modulated signal being configured to provide data concerning a direction of a signal to distinguish a target conductor; and including all of the other limitations in the respective independent claims.

U. S. Publication 2004/0070399 to Olsson et al. in view of U. S. Patent No. 6,310,579 to Meredith are references closest to the claimed invention. Olsson et al. in combination with Meredith disclose Olsson et al. disclose a locator receiver, comprising: at least one processing channel including an electromagnetic field detector, an analog processor coupled to receive

signals from the electromagnetic field detector, and a digital processor coupled to receive signals from the analog processor and calculate a signal strength parameter and a modulated signal, wherein the digital processor includes an analog-to-digital converter, a digital phase-locked loop coupled to receive the output signal from the analog-to-digital converter and provide the signal strength parameter, and a nested digital phase-locked loop coupled to the phase-locked loop to provide the modulated signal. However, Olsson et al. in combination with Meredith do not teach the analog-to-digital converter operates at twice the bandwidth of a highest selectable frequency of an electromagnetic field detected by the electromagnetic field detector; and including all of the other limitations in the respective independent claims.

U. S. Publication 2004/0070399 to Olsson et al. in view of U. S. Patent No. 6,310,579 to Meredith are references closest to the claimed invention. Olsson et al. in combination with Meredith disclose Olsson et al. disclose a locator receiver, comprising: at least one processing channel including an electromagnetic field detector, an analog processor coupled to receive signals from the electromagnetic field detector, and a digital processor coupled to receive signals from the analog processor and calculate a signal strength parameter and a modulated signal, wherein the digital processor includes an analog-to-digital converter, a digital phase-locked loop coupled to receive the output signal from the analog-to-digital converter and provide the signal strength parameter, and a nested digital phase-locked loop coupled to the phase-locked loop to provide the modulated signal. However, Olsson et al. in combination with Meredith do not teach a processor coupled to receive the signal strength parameter from each of the at least one processing channel and provide values of characteristics of a conductor based on the signal

strength parameter to a display; and including all of the other limitations in the respective independent claims.

U. S. Publication 2004/0070399 to Olsson et al. in view of U. S. Patent No. 6,310,579 to Meredith are references closest to the claimed invention. Olsson et al. in combination with Meredith disclose Olsson et al. disclose a locator receiver, comprising: at least one processing channel including an electromagnetic field detector, an analog processor coupled to receive signals from the electromagnetic field detector, and a digital processor coupled to receive signals from the analog processor and calculate a signal strength parameter and a modulated signal, wherein the digital processor includes an analog-to-digital converter, a digital phase-locked loop coupled to receive the output signal from the analog-to-digital converter and provide the signal strength parameter, and a nested digital phase-locked loop coupled to the phase-locked loop to provide the modulated signal. However, Olsson et al. in combination with Meredith do not teach the analog-to-digital converter operating at a sample rate of less than twice the bandwidth of a highest selectable locate frequency; and including all of the other limitations in the respective independent claims.

U. S. Publication 2004/0070399 to Olsson et al. in view of U. S. Patent No. 6,310,579 to Meredith are references closest to the claimed invention. Olsson et al. in combination with Meredith disclose Olsson et al. disclose a locator receiver, comprising: at least one processing channel including an electromagnetic field detector, an analog processor coupled to receive signals from the electromagnetic field detector, and a digital processor coupled to receive signals from the analog processor and calculate a signal strength parameter and a modulated signal, wherein the digital processor includes an analog-to-digital converter, a digital phase-locked loop

coupled to receive the output signal from the analog-to-digital converter and provide the signal strength parameter, and a nested digital phase-locked loop coupled to the phase-locked loop to provide the modulated signal. However, Olsson et al. in combination with Meredith do not teach a numerically controlled oscillator coupled to receive an error signal and update a carrier frequency, a cosine signal, and an inverted sine signal; a quadrature arm coupled to receive the inverted sine signal and the output signal from the analog-to-digital converter and generate a quadrature signal; an in-phase arm coupled to receive the cosine signal and the output signal from the analog-to-digital converter and generate an in-phase signal; and an error block coupled to receive the quadrature signal and the in-phase signal and calculate the error signal.

U. S. Publication 2004/0070399 to Olsson et al. is the reference closest to the claimed invention. Olsson et al. disclose a method of signal processing, comprising: receiving a signal in a detector; digitizing the signal to form a digitized signal; determining a signal strength from an output signal of a digital phased-lock loop coupled to receive the digitized signal; and determining a modulated signal in a nested digital phased-lock loop coupled to the digital phased-lock loop. However, Olsson et al. do not teach determining the signal strength from the output signal of the digital phase-lock loop comprises: updating an inverted sine value and a cosine value based on an error signal, mixing the inverted sine value with the signal in a quadrature arm to form a quadrature signal, mixing the cosine value with the signal in an in-phase arm to form an in-phase signal, and determining the error signal from the quadrature signal and the in-phase signal and determining a modulated signal in a nested digital phased-lock loop coupled to the digital phase-lock loop; and including all of the other limitations in the respective independent claims.

U. S. Patent No. 4,942,360 to Candy is the reference closest to the claimed invention. Candy discloses a locator receiver, comprising: a first digital phase-locked loop with a first numerically controlled oscillator coupled to receive a signal and provide a first phase related to a first frequency; and a second digital phase-locked loop with a second numerically controlled oscillator coupled to receive the signal and provide a second phase related to a second frequency. However, Candy does not teach the signal related to the first frequency and the signal related to the second frequency determining a signal direction of a conductor; and including all of the other limitations in the respective independent claims; and including all of the other limitations in the respective independent claims.

U. S. Patent No. 4,942,360 to Candy is the reference closest to the claimed invention. Candy discloses a method of determining signal direction, comprising: receiving a digitized signal; determining a first phase with a first digital phase-locked loop locked to a first frequency; determining a second phase with a second digital phase-locked loop locked to a second frequency; determining the signal direction in a conductor from the first frequency and the second frequency. However, Candy does not teach determining the signal direction in a conductor from the first frequency and the second frequency; and including all of the other limitations in the respective independent claims; and including all of the other limitations in the respective independent claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Contact Information

3. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carol S. W. Tsai whose telephone number is (571) 272-2224. The examiner can normally be reached on Monday-Friday from 8:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marc S. Hoff can be reached on (571) 272-2216. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 886-217-9197 (toll-free).

cswt
December 20, 2005
Art Unit 2857

CAROL S.W. TSAI
PRIMARY EXAMINER